UNITED STATES PATENT APPLICATION

For

REVERSIBLE CHILD RESISTANT CLOSURE

Inventors:
David Miceli
Joseph Miceli

Tri-State Distribution
HC 69
Box 398
Spencer, TN 38585

FIELD OF THE INVENTION:

The present invention relates a closure that may be applied to a vial or other container in either a child resistant configuration or a non-child resistant configuration. In its child resistant configuration the closure provides an obstacle to children being able to remove the closure from the container, however, in its non-child resistant configuration the closure allows for ready removal of the closure from the container. The present invention also provides a closure and container assembly.

BACKGROUND OF THE INVENTION:

There are many varying types of child resistant closure systems disclosed in the art. An example of a particular type of child resistant closure system is disclosed in U.S. Patent No. 5,449,078, which relates to a combination of a container and safety cap. While many child resistant caps effectively provide protection against the danger of small children being able to remove potentially harmful pills from vials or other containers, they also provide a problem for a considerable portion of the adult population that require medication, however, lack the manual dexterity or strength to remove the child resistant cap. This is of a particular concern to the elderly population or people suffering from arthritis and other disabilitating diseases.

This particular problem has been addressed by the development of closure systems having a child resistant mode and a non-child resistant mode such that, in the non-child resistant mode, the closures are more easily opened by adults. An example of such a closure is disclosed in U.S. Patent No. 5,579,934, (the '934 patent) which is herein incorporated by reference. The '934 patent discloses a container closure that is

selectively manipulable between a configuration which resists opening by children and a configuration which may be easily opened without special manipulation of the closure. Specifically, the closure is manipulated into its non-child resistant mode by "pressing down" on the central portion of the top surface of the closure. Although the aforementioned closure effectively provides protection against the danger of small children being able to remove it from vials or other containers, a certain portion of the adult population lack the manual dexterity or strength to "press down" the central portion of the top surface of the closure so to manipulate the closure from its child resistant configuration to its non-child resistant configuration. This manipulation or "pushing down" also represents a problem for people with long fingernails. Other reversible child resistant closures have been developed to address this problem, however, making the closure easier to convert into the non-child resistant configuration increase the risk that the closures will inadvertently be converted into their non-child resistant configurations. Similarly, there is an increased risk that automated filling machines will inadvertently convert the closures into their non-child resistant configurations when applying the closure to the container.

Further, the closures of the type disclosed in the '934 patent cannot include a warning to the consumer once the closure has been converted to its non-child resistant configuration. This message is required by the Consumer Product Safety Commission ("CPSC") to alert users that the closure has been converted into the non-child resistant configuration.

Furthermore, other reversible child resistant designs that do include the CPSC consumer warning cannot be used in automated dispensing equipment due to projections on their outer surface.

In light of the foregoing, there is a need for a closure that has a child resistant mode which resists opening by children, has a non-child resistant mode which may be easily opened without special manipulation, resists inadvertent conversion from its child resistant mode to its non-child resistant mode, is capable of including the mandated CPSC warning "CAUTION NOT CHILD RESISTANT" when used in its non-child resistant mode, and can be used in automated dispensing machines so overcoming the aforementioned deficiencies of the prior art.

SUMMARY OF THE INVENTION:

Accordingly, the present invention is directed to a closure that substantially obviates one or more of the problems due to limitations and disadvantages of the related art. Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the apparatus particularly pointed out in the written description and claims hereof as well as in the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described, the reversible child resistant closure of the present invention for use with a container having a neck portion has an engaging means and an axis extending therethrough about which the closure is rotatable. The closure has a child resistant mode when applied to the container in a first child resistant position and

has a non-child resistant mode when applied to the container in a second non-child resistant position. The closure includes an outer cap and an inner cap. The outer cap includes a first circumferential side wall that extends from a top edge to a bottom edge. This first circumferential side wall has a first inner surface with a non-child resistant engaging means for rotatable engagement with the engaging means of the container and a first child resistant engaging means axially offset from the non-child resistant engaging means comprising a series of angular abutments extending about the first inner surface. The inner cap includes a second circumferential side wall extending axially from an upper surface and has a second inner surface and an outer surface. The second inner surface is provided with a second child resistant engaging means for rotateable engagement with the engaging means of the container and the outer surface is provided with a third child resistant engaging means having a plurality of angular abutment surfaces complementary to the series of angular abutments on the outer cap.

The inner cap is coaxially positioned and nested within the outer cap and is axially movable between the first child resistant engaging means and the bottom edge of the outer cap such that the plurality of angular abutment surfaces of the inner cap engage the series of angular abutments of the outer cap upon rotation of the outer cap to rotate the inner cap in a closing direction. However, upon rotation of the outer cap member in an opening direction in the absence of an axial force, the plurality of angular abutment surfaces of the inner cap cam over and past the series of angular abutments of the outer cap so preventing rotation of the inner cap.

In another aspect, the present invention includes a closure system being the combination of the closure of the present invention and a container.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

The accompanying drawings are included to provide a further understanding of the invention and are incorporated in and constitute part of this specification, illustrate several embodiments of the invention and together with the description serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the drawings, wherein like reference numerals identify similar elements throughout several views:

FIG. 1A is an exploded view, partly in side elevation and partly in cross section, of a child resistant container and closure combination constructed in accordance with the present invention, the closure being relatively positioned to resist opening of a container by children.

FIG. 1B is a view like FIG. 1A but the closure being relatively positioned to permit easy opening by an adult.

FIG. 2 is top perspective view of the inner cap of the closure of FIGS. 1A and 1B.

FIG. 3 is side view of the inner cap of the closure of FIGS. 1A and 1B.

FIG. 4 is cross sectional side view of the inner cap of FIGS. 2 and 3.

FIG. 5 is bottom perspective view of the outer cap of the closure of FIGS. 1A and 1B.

FIG. 6 is side view of the outer cap of the closure of FIGS. 1A and 1B.

FIG. 7 is cross sectional side view of the outer cap of FIGS. 5 and 6.

Figs. c3>

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE PRESENT INVENTION:

Referring now to the drawings of the present disclosure in which like numbers represent the same structure in the various views, FIGS. 1A and 1B show a reversible child resistant closure system in accordance with the present invention. FIG. 1A shows the closure in its child resistant mode and FIG. 1B shows the same closure in its non-child resistant mode. The closure system comprises a reversible child resistant closure **10** and a container **40**. The closure **10** includes an outer cap **20** and an inner cap **30**. The closure **10** is constructed for use with a container **40** having any suitable engaging means, for example, a threaded neck portion **50**, and is primarily directed for use with containers which store and dispense pharmaceutical products and the like but may also be used with any container having a suitable engaging means, irrespective of its contents. As will be described in more detail below, the inner cap **30** is coaxially positioned and nested within the outer cap **20** such that it is movable between a child resistant engaging means of the outer cap **20**, shown in the embodiment at FIGS. 1A and 1B as a series of angular teeth **230**, and the bottom edge **15**.

As best shown in FIGS. 2, 3 and 4 the inner cap includes an upper surface **60** that has a circumferential side wall **70** extending therefrom. The side wall **70** has an inner surface **100** which includes an engaging means for rotatably engaging the engaging means of the container. Any suitable engaging means for rotatable engagement may be used. For example the engaging means may be a thread bead for engaging the threaded exterior surface portion **50** of the container **40** shown in FIGS. 1A and 1B. Preferably, the engaging means is a single thread bead. More preferably, as shown in FIG. 4, the engaging means is a double thread bead **120**. The side wall **70** of the inner cap **30** also has an outer surface **110** and a child resistant portion comprising a series of angular abutments. As shown in FIGS. 2, 3 and 4, preferably the series of angular abutments extend upward from the side wall **70** such that the outer side **75** of each angular abutment, shown here as angular teeth **85**, is about flush with and parallel to the outer surface **110** of the inner cap **30**. As can best be seen from FIG. 3, each tooth **85** forming the series of angular abutments of the child resistant portion of the inner cap **30** has a first sloped surface **150** and a second substantially vertical surface **160**. The first sloped surface **150** and the second substantially vertical surface **160** define an angle θ which is preferably in the range of from about 22^0 to about 45^0, and is more preferably about 25^0 to about 33^0. Each tooth may abut directly with the next, or may be spaced apart by surface **170**. Preferably each tooth abuts directly with the next. Any suitable numbers of teeth may be utilized, however, preferably between twenty (20) and fifty (50) teeth **85** are included. Most preferably, the inner cap **30** comprises about thirty six (36) individual teeth.

In a preferred embodiment, as best shown in FIG. 4, the upper surface **60** of the inner cap **30** has an inner surface **35**. To comply with CPSC requirements, the inner surface **35** includes a warning, for example "CAUTION NOT CHILD RESISTANT." A liner, in the shape of a disc may also be included such that it fits inside the inner cap adjacent and parallel to the inner surface **35**. If a liner is used, then the visible side of the liner may also include a warning, for example "CAUTION NOT CHILD RESISTANT."

Referring now to FIG. 5, the outer cap **20** has a circumferential side wall **90** extending from a top edge **80** to a bottom edge **15** and has an inner surface **200** and an outer surface **210**. The outer surface **210** may further comprise a gripping means to facilitate rotation of the closure **10** to aid both putting the closure on the container **40** and subsequent removal. Any suitable gripping means may be utilized. In a preferred embodiment, knerlments **300** are disposed about the outer surface **210** of the outer cap **20**. Preferably, the top edge **80** surrounds a central opening **220** which can be best seen in FIG. 7.

The inner surface **200** of the outer **20** is provided with a child resistant region which includes a plurality of angular abutment surfaces which are of size, position and orientation to complement the series of angular abutments extending from the outer surface of the child resistant portion of the side wall **70** of the inner cap **30**. As shown in FIG. 7, these angular abutments are preferably in the form of angular teeth **230**, each tooth having a first sloped surface **240** and a second substantially vertical surface **250**. The sloped first surface **240** and the substantially vertical surface **250** define an angle α preferably ranging from about 22^0 to about 45^0, and more preferably about 25^0 to about 33^0. The inner cap 30 may have any suitable numbers of such sloped first surfaces **240**.

In the preferred embodiment show in the FIGS. the ratio of the teeth of the inner cap to the angular teeth **230** of the outer cap is one to one. However, any other integral ratio may be used, for example, two to one, three to one, or the like. In a more preferred embodiment, thirty six (36) sloped surfaces **240** are used which compliment the thirty six (36) teeth **85** of the preferred inner cap **20**.

The angular abutment surfaces on the outer cap **20** are angled in the same direction as the series of angular abutments extending from the outer surface of the side wall **70** of the inner cap **30**. Further, angles θ and α defined by the abutments of the outer cap **20** and the inner cap **30** respectively are preferably close to each other. Thus, when the closure **10** is in its child resistant mode as shown in FIG. 1A, and when the outer cap **20** is rotated in the opening direction, the abutment surfaces of the outer cap **20** will ratchet or ride over the angular abutment surfaces of the inner cap **30**, thereby permitting rotation of the outer cap **20** relative to the inner cap **30**. This, however, can be overcome by the application of an axial force on the outer cap **20** toward the inner cap **30** in combination with rotation of the outer cap **20** in the opening direction, which prevents the ratcheting of the angular abutment surfaces of the outer cap **20** over the angular abutment surfaces of the inner cap **30**, which in turn causes the inner cap **30** to rotate with the outer cap **20** in the opening direction.

The inner surface **200** of the outer cap **20** is also provided with a non-child resistant engaging means for rotatably engaging the engaging means of the container **40**. Any suitable engaging means may be used that is complementary to the engaging means of the container **40**. For example, as shown in FIG. 7, the non-child resistant engaging means may be a thread bead for engaging the threaded exterior surface portion **50** of the

container **40**. Preferably, the engaging means is a single thread bead. More preferably, as shown in FIG. 7, the engaging means in a double thread bead **125**.

Sub. C2 Thus, to convert the closure **10** from its child resistant mode to its non-child resistant mode simply requires the user to remove the outer cap **20** from the container **40** and inverting the closure **10** and simply rotatably attach the closure **10** to the container **40** by rotating he closure **10** in a closing direction which is preferably clockwise. The inner surface **200** may also include a lip **270** which prevents the inner cap **30** from moving past the child resistant region and out of nesting relation with the outer cap **20**.

In order to convert the child resistant closure **10** from its non-child resistant mode as shown in FIG. 1B to its child resistant mode as shown in FIG. 1A, the user simply removes the closure **10** from the container **40** by rotating the closure in an opening direction, preferably counter-clockwise, and then inverting the closure **10** and then simply rotatably attaching the closure **10** to the container **40** by rotating the closure **10** in a closing direction, which is preferably clockwise.

In order to utilize a preferred embodiment of the closure **10** when in a child resistant mode, as shown in FIG. 1A, the closure **10** is first placed on the threaded portion **50** of the container **40** by threadedly engaging thread **120** on inner cap **30** with the threaded portion **50**. A rotative force turns the outer cap **20** in the closing direction, here shown to be clockwise. The substantially vertical surfaces **160** of the teeth on the inner cap **30** and sloped first surfaces **240** on the outer cap **20** interengage to cause the inner and outer caps to turn together, e.g. to cause the inner cap **30** to remain rotationally stationary relative to the outer cap **20**, to close the container. Upon closing the container

40 further rotation of the closure **10** in the closing direction is prevented. Rotation of the closure **10** in the opposite direction will cause the sloped first surfaces **240** of the outer cap **20** to ratchet or ride over the first sloped first surfaces **150** of the teeth of the inner cap **30**. That is to say, the mere turning of the outer cap **20** in the opening direction will not rotate inner cap **30** in an opening direction because there is no transmission of torque from the outer to the inner cap as the sloped first surfaces **240** ride over and slide by the sloped first surfaces **150**.

In order to open the closed container **40** with closure **10** in its child resistant mode, the user must utilize both a rotative and an axial force. It is the axial force that prevents the sloped first surfaces **240** of the outer cap **20** from ratcheting or riding up and over sloped first surfaces **150** of the inner cap **30**. Thus, when the outer cap **20** is rotated in an opening direction, here counterclockwise, with the use of both rotational and axial force, the sloped first surfaces **240** of the outer cap **20** are prevented from ratcheting over sloped first surfaces **150** but instead engage one another to transmit torque between sloped first surfaces **240** and sloped first surfaces **150** to thereby rotate the inner cap **30** causing it to disengage from the threaded portion **50** of the container **40**. Accordingly, the closure **10** is disengaged from the container **40** and the container is open.

This is the presently preferred form for effecting the child resistant feature of the present invention. Of course, other means for drivingly connecting the inner and outer cap members relative to one another may be employed without departing from this invention. See for example, U.S. Patent No. 5,579,934 (herein incorporated by reference) for suitable alternatives.

It is to be understood that the reversible closure device provided in accordance with the present invention can be formed of any suitable material such as plastic or metal or a combination of materials and the like and that the invention is not intended to be limited by the material from which the devices are formed.

It will be apparent to those skilled in the art that various modifications and variations can be made to the closure of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents. Accordingly, the invention is not limited by the embodiments described above which are presented as examples only but can be modified in various ways within the scope of protection defined by the appended patent claims.